Parts of the Atom
and
The Periodic Table

- Atoms are made of _____, _____, and _____.
- The number of protons in the nucleus of the atom is its _____ _____.
- A neutral atom must contain the _____ number of positive and negative charges, so the number of _____ equals the number of _____.
- The total number of _____ and _____ in an atom is called its _____.

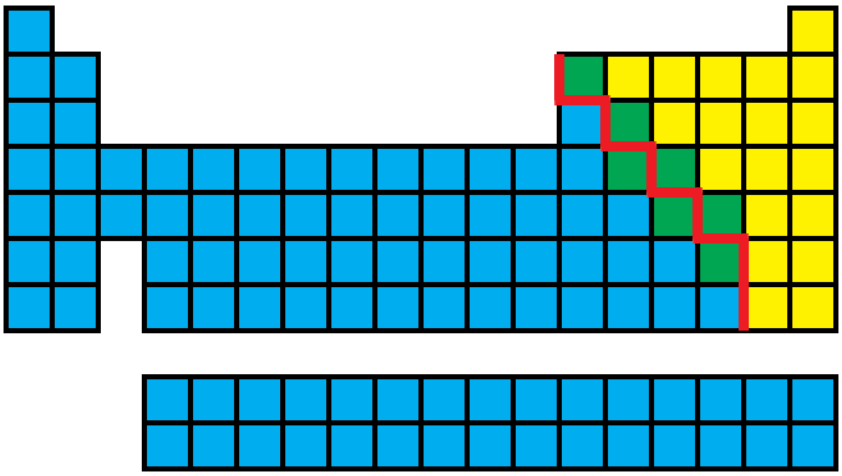
Atomic number (Z) = _____

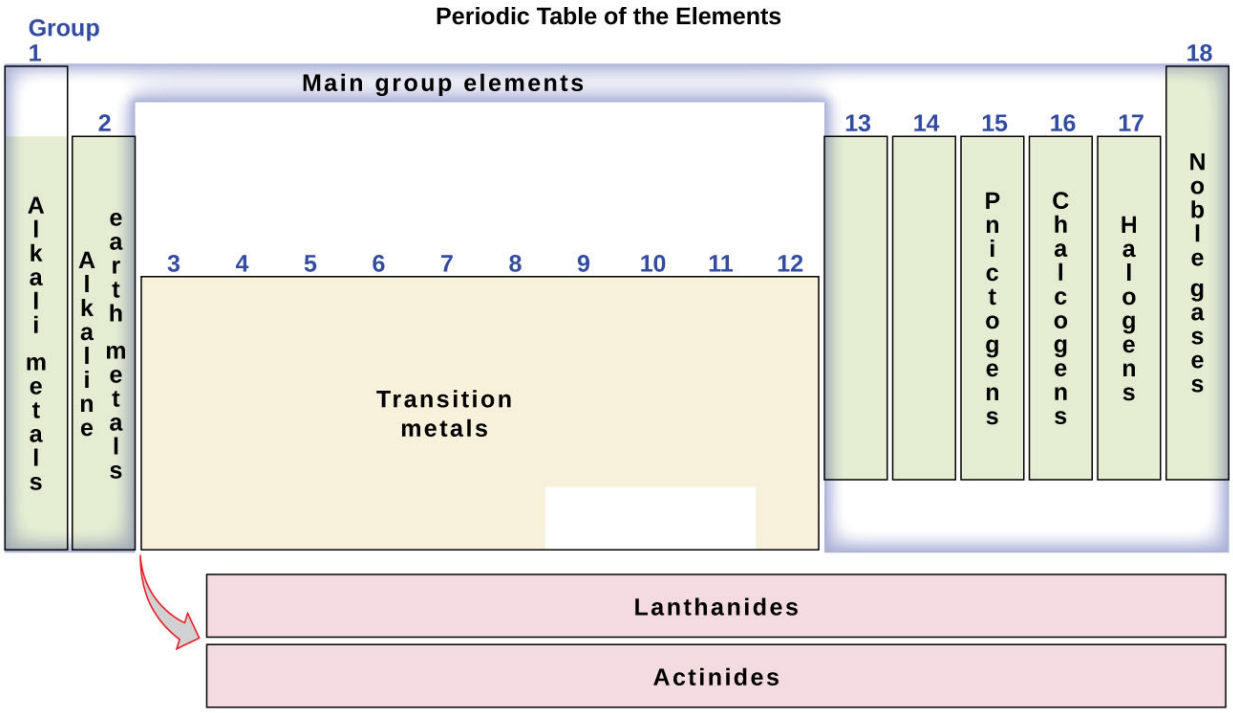
Mass number (A) = _____

A-Z = _____

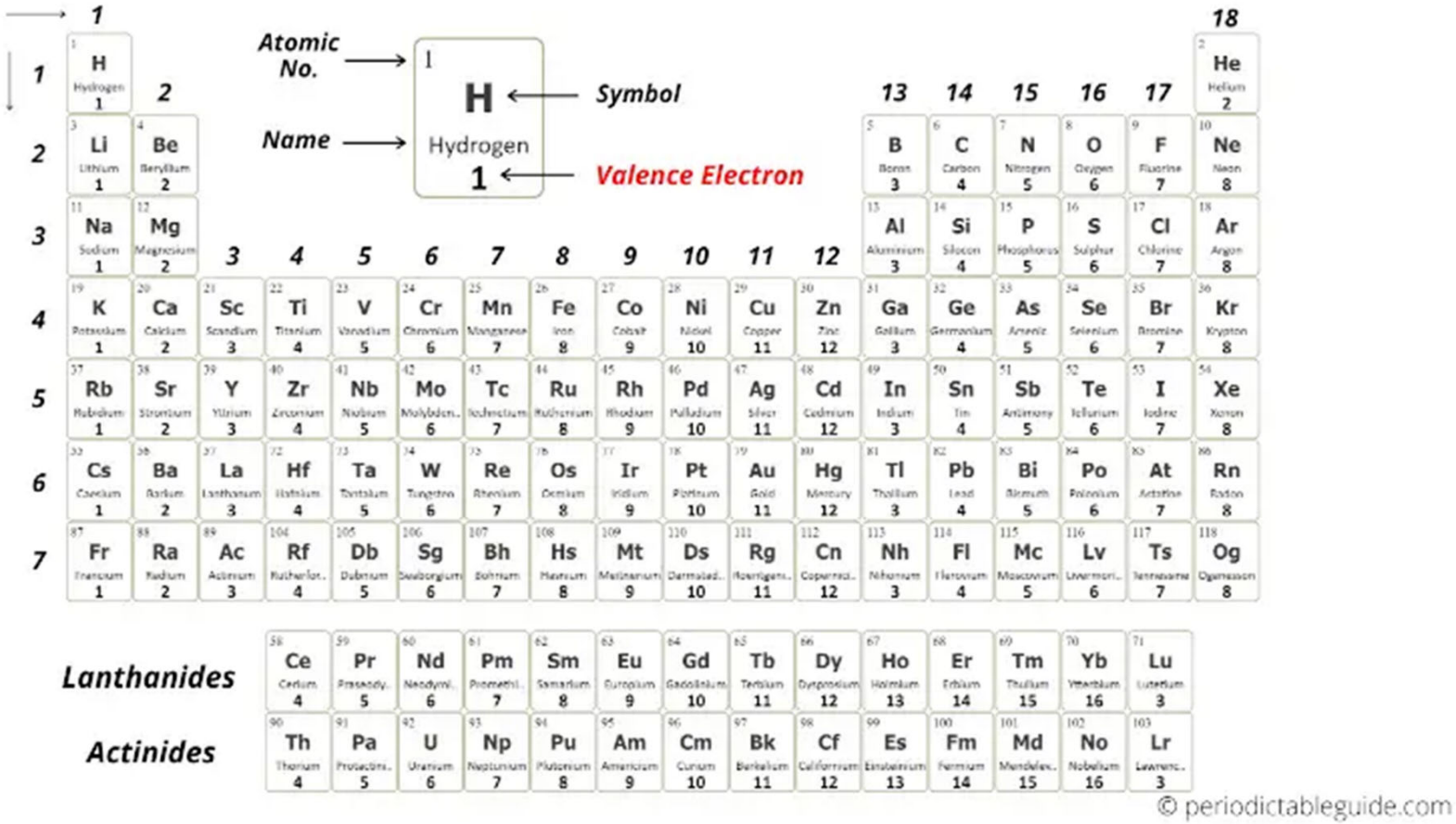
- Atoms are electrically _____ if they contain the _____ number of positively charged _____ and negatively charged _____.
- When the numbers of these subatomic particles are _____ equal, the atom is electrically charged and is called an _____.

- The periodic table arranges the elements in increasing order of their _____ _____ and groups atoms with similar _____ in the same vertical column.





- Atoms have a _____ (containing protons and neutrons) surrounded by electrons.
  - The electrons exist at various _____.
- The electrons in the outermost energy level are called _____ _____.
  - For example, oxygen has a total of _____ electrons.
    - _____ in the first energy level
    - _____ in the second energy level
    - Therefore, oxygen has _____ valance electrons.
- The periodic table is designed such that elements in the same _____ have the same number of _____ electrons.


Atomic No.
Name
Symbol
Valence Electron
1
H
Hydrogen
1
Lanthanides
Actinides
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Lewis Structures
(Electron Dot Diagrams)

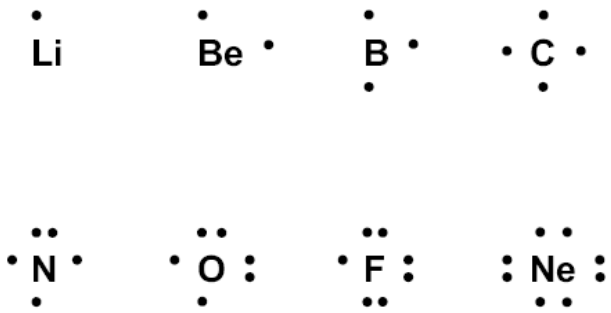
- A Lewis structure is a convenient shorthand way to represent an atom and its _____ electrons.
  - Dots are placed around the _____ _____of an element to illustrate the _____ electrons.

Drawing Lewis Structures

- Write the _____ _____ for the atom.
- Place dots around the outside representing the _____ electrons.
  - The first 4 valence electrons are placed one on each side of the chemical symbol starting at the _____ and going _____.
  - The next 4 valence electrons are placed such that there are now _____ electrons on each side, again starting at the _____ and going _____.
- Draw the Lewis structure for magnesium.

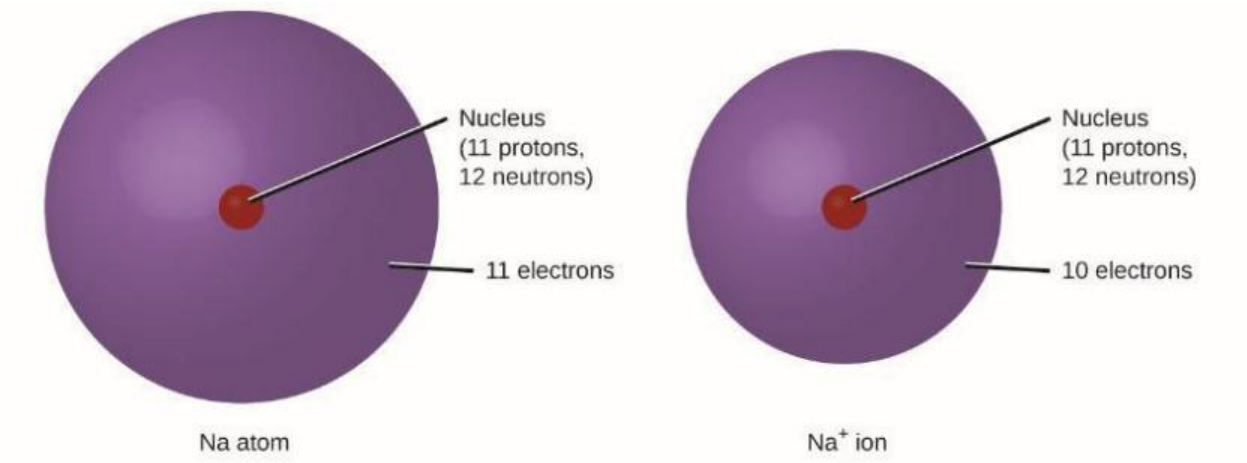
- Draw the Lewis structure for fluorine.

- The Lewis structure for the elements in the second period are as follows:



Ionic and Molecular Compounds

- In ordinary chemical reactions, the nucleus of each atom (and thus the identity of the element) remains _____.
- During the formation of some compounds, atoms _____ or _____ electrons, and form electrically charged particles called _____.



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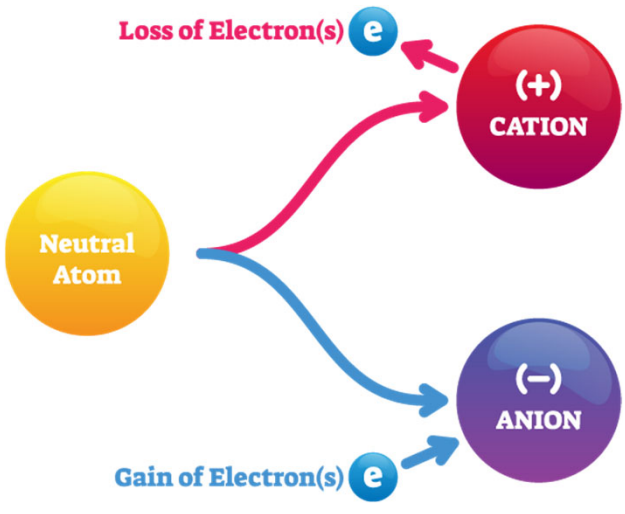
- You can use the periodic table to predict whether an atom will form an _____ or a _____, and you can often predict the _____ of the resulting ion.

- **Metals**
  - _____ electrons
  - Form _____
  - _____ charge

- **Non-Metals**
  - _____ electrons
  - Form _____
  - _____ charge



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- Most atoms lose or gain electrons to get _____ valance electrons.
  - Atoms are most stable when they have _____ valance electrons.
  - This is known as the _____.

Magnesium

Sulfur

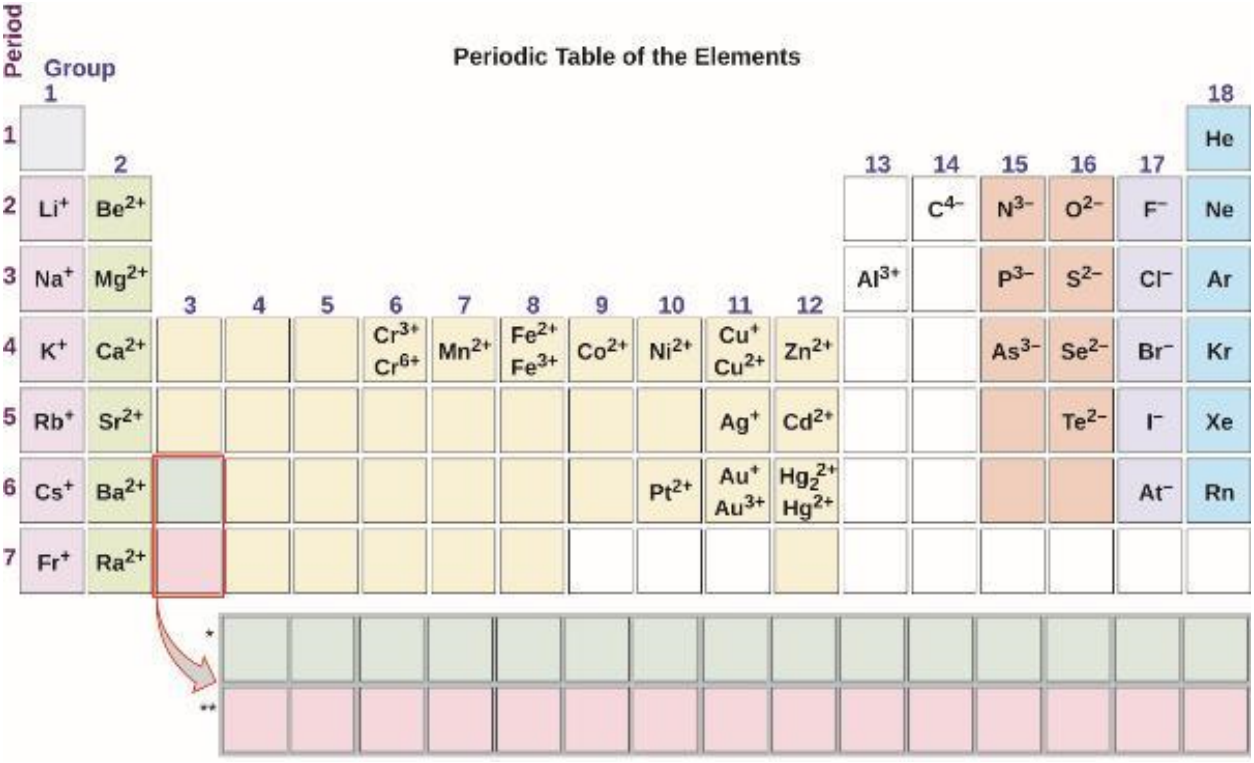
- The symbol for an ion is the symbol for the element with the charge.

Al^{3+}

O^{2-}

Note:
If the number of electrons gained or lost is 1, we only write the sign.
Example: _____

- Some elements exhibit a regular _____ of ionic charge when they form ions.



- Cations are named by adding the word _____ onto the name of the element.
  - Mg^{2+} - _____
  - Na^{+} - _____
  - Al^{3+} - _____

- Anions are named by adding the suffix _____ to the first syllable of the element name.
  - N^{3-} - _____
  - O^{2-} - _____
  - Cl^{-} - _____

- Ions formed from only one atom are called _____ ions.
- There are also _____ ions.
- These ions, which act as discrete units, are electrically charged molecules (a group of bonded atoms with an overall charge).
  - SO_4^{2-} (_____)
  - OH^- (_____)
  - NO_3^- (_____)

Example

Magnesium and nitrogen react to form an ionic compound. Predict which forms an anion, which forms a cation, and the charges of each ion. Write the symbol for each ion and name them.

Noble Gases

- Noble gases (group 18) have _____ electrons.
  - Helium is an exception as it can only have _____ valance electrons.
- Noble gases usually _____ form ions.

Ionic Compounds

- When an element composed of atoms that readily lose electrons (_____) reacts with an element composed of atoms that readily gain electrons (_____), a _____ of electrons usually occurs, producing _____.
- The compound formed by this transfer is stabilized by the electrostatic _____ (ionic bonds) between the ions of opposite charge present in the compound.

Example

Sodium reacts with chlorine

- A compound that contains ions and is held together by ionic bonds is called an _____ _____.
- When a metal is combined with one or more nonmetals, the compound is usually _____.
- You can often recognize ionic compounds because of their _____.
  - Ionic compounds are _____ that typically _____ at high temperatures and _____ at even higher temperatures.
- In every ionic compound, the total number of _____ charges of the _____ equals the total number of _____ charges of the _____.
- The formula of an ionic compound must have a ratio of ions such that the numbers of _____ and _____ charges are _____.

Example

Sodium reacts with oxygen

Example

Magnesium reacts with chlorine

- Many ionic compounds contain polyatomic ions as the _____, the _____, or _____.
- These compounds must be electrically _____, so their formulas can be predicted by treating the polyatomic ions as discrete units.
- We use parentheses in a formula to indicate a group of atoms that behave as a _____.

Example

Calcium reacts with phosphate

Predict the formula for the ionic compound formed between

sodium and sulfur _____

calcium and oxygen _____

potassium and iodine _____

magnesium and the sulfate ion (SO_4^{2-}) _____

Molecular Compounds

- Many compounds do not contain _____ but instead consist solely of discrete, neutral _____.
- These _____ compounds (covalent compounds) result when atoms _____ electrons.
    - Each _____ of shared electrons is referred to as a _____.
- Molecular compounds are usually formed by a combination of _____.
- We can often identify molecular compounds based on their _____ properties.
    - Under normal conditions, molecular compounds often exist as _____, low-boiling _____, and low-melting _____.

Example	Example
CO_2	CH_4

Diatomic Molecules

- A diatomic molecule consists of _____ of the _____ _____ atoms.
- Seven elements exist naturally as _____ molecules.
  - _____

Are the following ionic or molecular compounds?

KI _____

H_2O_2 _____

$CHCl_3$ _____

Li_2CO_3 _____

SO_2 _____

CaF_2 _____

N_2H_2 _____

$Al_2(SO_4)_2$ _____